Mineralogy

CONCEPTS

DESCRIPTIONS

DETERMINATIONS

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This book is designed to satisfy t
in mineralogy It is intended not
advanced work in the subject but
for whom this is not only the first
phasi is therefore given to gener
eralogical data in interpreting ge
of petrology and economic geolog

A guiding principle in the writin
mineral—a phase in the earth s cr
conditions that caused it to form
Minerals are products of geological
conclusions as to the nature of the
of mineralogy is that we can use th
observ in the field It is possible t
under controlled conditions of ten
ment This enables elucidation of t
hence the conditions under which

These aims have placed special
as it is treated here The considerati
giving ttention to both external for
dependence The chemistry of min
solid state chemistry, requiring con
types of bonding and the significa
structure this leads to discussions
polymorphism in minerals In the tr
emphasized the interrelations of p

silicates exist as minerals Structures containing both Si_2O_7 and independent SiO_4 groups also occur, the most important being idocrase and the minerals of the epidote group

Lawsonite, $CaAl_2Si_2O_7(OH)_2 \cdot H_2O$

Crystal system and class Orthorhombic 222
Axial elements $a : b : c = 1.545 : 1 : 2.314$
Cell dimensions and content $a = 8.90$ $b = 5.76$ $c = 13.33$ $Z = 4$
Habit Prismatic crystals sometimes tabular parallel to c also massive granular
Cleavage {100} {001} perfect {110} poor
Hardness 8
Density 3.09
Color White pale blue pale gray
Streak White
Luster Vitreous to greasy
Chemistry The composition of lawsonite is similar to that of anorthite, but the structure is quite different, being much more closely packed (note the higher density and superior hardness of lawsonite) The structure consists of chains of six coordinated aluminum oxygen (and hydroxyl) groups, linked sideways by the Si_2O_7 groups in the framework so formed there are 'holes occupied by the calcium ions and water molecules
Diagnostic features The hardness, comparatively high density and common association with glaucophane are diagnostic for lawsonite
Occurrence Lawsonite is a mineral of metamorphic rocks and typically occurs in glaucophane schists It is widely distributed in these rocks in California (it was first recognized in 1895 in the glaucophane schists of the Tiburon Peninsula, in San Francisco Bay) It occurs in similar rocks in Italy Corsica, and New Caledonia

Hemimorphite, $Zn_4Si_2O_7(OH)_2 \cdot H_2O$

Crystal system and class Orthorhombic *mm*2
Axial elements $a : b : c = 0.7808 : 1 : 0.4776$
Cell dimensions and content $a = 8.370$, $b = 10.719$ $c = 5.120$ $Z = 2$
Habit Crystals usually thin tabular parallel to {010} (Fig 2.51b) also massive often in stalactitic or mammillary forms
Cleavage {110}, perfect
Hardness 5
Density 3.4–3.5
Color White, sometimes stained brown (with iron), or blue or green (with copper)
Streak White

Luster Vitreous
Other properties Strongly pyroelect
Chemistry On heating it decomp
fixes an upper temperature limit
Diagnostic features Soluble in HCl
tion In the closed tube it decrep
Occurrence In the oxidized zone of
sonite Fine specimens have been
Colorado Santa Eulalia and M
Rhodesia
Use A minor ore of zinc
Name This mineral was originall
has also been used for zinc carbon
in 1853 from the hemimorphic na
adopted by international agreem
the dual application of calamine

Idocrase, $Ca_{10}Mg_2Al_4(Si_2O_7)_2(SiO$

Crystal system and class Tetragonal
Axial elements $a : c = 1 : 0.757$
Cell dimensions and content $a = 15.6$

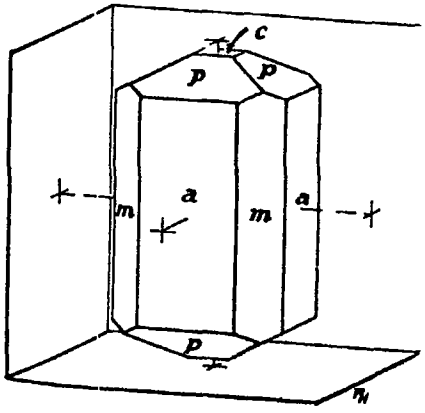

Fig 15-43 Typical forms in idocrase crystals $c\{001\}$ $a\{100\}$ $m\{110\}$ $p\{101\}$

Common forms and angles (Figs 15.4
$(001) \wedge (112) = 28° 11'$ (101
$(001) \wedge (101) = 37° 08'$ (211
$(001) \wedge (301) = 66° 14'$
Habit Prismatic or pyramidal cryst
Cleavage {110}, poor

Luster Vitreous

Other properties Strongly pyroelectric and piezoelectric

Chemistry On heating it decomposes into willemite at about 240°C which fixes an upper temperature limit in hemimorphite deposits

Diagnostic features Soluble in HCl giving gelatinous silica on partial evaporation In the closed tube it decrepitates and gives off water

Occurrence In the oxidized zone of zinc deposits, often associated with smithsonite Fine specimens have been found in Franklin, New Jersey Leadville, Colorado Santa Eulalia and Mapimi, Mexico and Broken Hill Northern Rhodesia

Use A minor ore of zinc

Name This mineral was originally known as *calamine*, which name however has also been used for zinc carbonate The name hemimorphite was proposed in 1853 from the hemimorphic nature of the crystals, and this name has been adopted by international agreement to eliminate the confusion caused by the dual application of calamine

Idocrase, $Ca_{10}Mg_2Al_4(Si_2O_7)_2(SiO_4)_5(OH)_4$

Crystal system and class Tetragonal, $4/m\ 2/m\ 2/m$

Axial elements $a\ c = 1\ 0\ 757$

Cell dimensions and content $a = 15\ 66\ \ c = 11\ 85\ \ Z = 4$

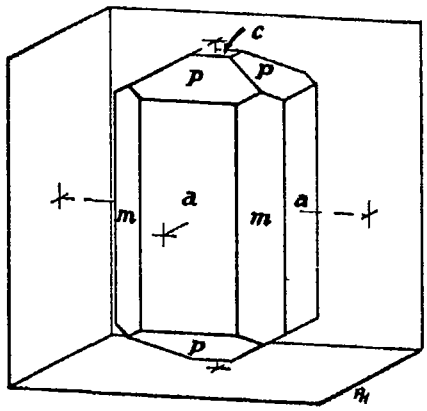

Fig 15 43 Typical forms in idocrase crystals $c\{001\}$ $a\{100\}$ $m\{110\}$ $p\{101\}$

Fig 15 44 Idocrase crystals greenish grav showing difference in habit from one locality Forms {100} {110} {101} {001} {211} (one small face) (Wiui River Siberia the USSR) [Courtesy Royal Ontario Museum]

Common forms and angles (Figs 15 43 15 44)

$(001) \wedge (112) = 28°\ 11'$ $\quad (101) \wedge (011) = 50°\ 32'$

$(001) \wedge (101) = 37°\ 08$ $\quad (211) \wedge (121) = 31°\ 36'$

$(001) \wedge (301) = 66\ 14$

Habit Prismatic or pyramidal crystals also massive, granular or compact

Cleavage {110} poor

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